The Fundamentals of Stochastic processes

Sheet no.5

1) Medical research has shown that a certain type of chemotherapy is successful 70% of the time when used to treat skin cancer .suppose five cancer patients are treated with this type of chemotherapy and let x equal the no. of successful cures out of the five .

x	0	1	2	3	4	5
P(x)	0.002	0.029	0.132	0.309	0.360	0.168

The probability distribution of x is given in the following table.

Find:

a) $\mu = E(x)$

b) $\sigma = \sqrt{E(x-\mu)^2}$

2) Find the expectation, variance .and the standard deviation of each of the following:

I)

x	2	3	11
P(x)	1/3	1/2	1/6

II)

x	-5	-4	1	2
P(x)	1/4	1/8	1/2	1/8

III)

x	1	3	4	5
P(x)	0.4	0.1	0.2	0.3

iv) $$p(x)=\begin{cases}\frac{2}{25}x & 0\le x\le 5\\ 0 & elsewhere\end{cases}$$

3) Prove for any random variable x

i) E (ax+b) = aE(x) + b

ii) V (ax + b) = a^2v(x)

iii) E (c) = c

iv) V (c) =0

4) The heart association claims that only 10% of adults over 30 can pass the physical fitness test. Suppose that four adults are randomly selected and each is given the fitness test.

a) Find the probability that none of the four adults pass the test

b) Find the probability that three of the four adults pass the test

c) Let x represent the number of the four adults who pass the test

d) Drive a formula for p(x), the probability distribution of the binomial random variable x.

5) Refer to problem 4. Use the formula for a binomial random variable to find the probability distribution of x, where x is the number of adults who pass the fitness test, graph the distribution

x	0	1	2	3	4
P(x)	0.6561	0.2916	0.0406	0.0036	0.0001

6) Refer to problem 5 .Calculate the mean and the standard deviation.

7) Give a formula for p(x) for a binomial random variable with n=7 and p= 0.2

8) Consider the following binomial probability distribution

$$P(x)=\binom{5}{x}(0.7)^x(0.3)^{5-x}, X = 0, 1, 2, 3, 4, 5$$

a) How many trials n are in the experiment?

b) What is the value of p .the probability of success?

c) Graph p(x)

d) Find the mean and the standard deviation of x.

9) Suppose X is a binomial random variable with n = 3 and p = 0.3

a) Calculate the value of p(x), x=0, 1, 2, 3, using the formula for a binomial probability distribution.

b) Find the mean and the standard deviation of x

10) If x is a binomial random variable. Calculate mean, variance and standard deviation for each of the following

a) n =80 ,p=0.2

b) n =70 ,p=0.9

c) n =1000 , p=0.04